

The Impact of Return-Current Losses on the Observed Emissions from Solar Flares

Gordon D. Holman

NASA Goddard Space Flight Center

Electrons accelerated in solar flares are expected to drive a co-spatial return current in the ambient plasma when they escape the acceleration region. This return current maintains plasma neutrality and the stability of the beam of streaming electrons. The electric field that drives this return current also decelerates the energetic electrons in the beam. The corresponding energy loss experienced by the accelerated electrons can affect the observed properties of the X-ray and radio emissions from flares and the evolution of the thermal flare plasma. I will discuss the properties of the flare emissions expected in a classical, steady-state model. As part of this discussion, I will examine Gordon Emslie's 1980 conjecture that return-current losses result in a maximum brightness for the hard X-ray emission from flares.